Report of Committee on Diseases, Insects and Method of Control.

[There was no regular report made by any member of the committee, but the question was opened for discussion, and this proved very interesting. The following is as full a report as the stenographer was able to make.—Sec.]

Mr. Hart.—Mr. President, I regret to say that I have been unable to make any report owing to the fact that I have been in a dark room for some weeks, unable to read or write and have had to depend upon some one else to do my writing for me. After the President had notified me I was on this committee I communicated with other members telling them of my disability and urging them to attend to the work necessary to a good report.

Mr. Hubbard.—I have no formal report on this subject. I have had no experience with the white fly, not even like our friend Mr. Hart. I have a small joke at Mr. Hart's expense. One of our neighbors sent him a specimen and asked if it was the white fly, he also wrote Mr. Hart, but Mr. Hart was so afraid of the white fly that he immediately burned it without examination. I do not believe this gentleman had the white fly, but he did have the white wax scale. The red fungus is now attacking this scale and I think he will soon be rid of it.

I practically do no spraying. In cases of small trees I use a small atomizer, using pure kerosense and treating them on a warm, dry day, putting it on carefully. The kerosene will evaporate in about an hour and one application will remove most of the scale and will not hurt the foliage. Kerosene has practically the same chemical composition as turpentine and the essential oil of the orange, so that when it evaporates it has very little effect on the tree. If you should saturate the tree with the kerosene, of course it might do some damage.

(Question.) Have you used whale oil soap?

Mr. Hubbard.—I used to do this, but am now depending on Lady bugs and fungus. Orange trees may have some scale the first season, but the next year the lady bug and fungus will clean them out pretty thoroughly. If a man sprays for red spider etc., he kills the fungus and has to keep up the spraying continually.

Maj. Healy.—Mr Waite seems to be the only one who has had any experience with the white fly.

Mr. Waite.—One of the oldest groves we have, contains 600 large trees, so large we cannot get in between them to spray. This grove has been infested with the fly for ten or fifteen years. The fungi is very abundant, also about one hundred trees are inhabited by the snail, specimens of which I have brought with me. We commenced picking this crop of 4000 boxes during Christmas week and finished about the twentieth of January we

had a great deal of rainy weather at the time. Every box was washed except that which had been beautifully cleaned by the snail. The fruit carried well, and sold for $3.00 per box in Providence R. I. The trees cleaned by the snail gave us a uniform bloom this spring, while the balance of the grove bloomed only in the tops of the trees.

Saturday night I went over to the grove to get specimens of the snail but could only find a few, and concluded that our neighbors had gathered the greater portion of them, but Sunday it rained during the night, and the next morning my foreman found plenty of them crawling up and down the trunks, and over the foilage, and he said that many of the snails had particles of sand still sticking to them. We are not certain that they do not burrow in the earth during the cool winter weather, coming out when the weather is warm, and the atmosphere moist. They do not move around or feed, only when the sooty mold is wet, which I presume enables them to eat it more readily, and in doing so they clean up the eggs of the fly.

Mr. Hart.—Mr. President, I wish to ask Mr. Waite if in spraying he would risk clear water.

Mr. Waite.—This would assist the snails and after two or three sprayings the fungi would make their appearance, for this reason I would reccommend to those who do not wish to use insecticides and fungucides, spraying with clear water, and if done toward night, it would keep the sooty mold moist all night.

Mr. Hart.—What kind of a nozzle would you use?

Mr. Waite.—We use the Big Boston in a solid spray on the tall trees, and the Vermoel for small trees and where we wish to throw a mist over the fruit for the rust mite.

Mr. Bell.—I would like to know whether or not the result of the fungi mentioned is a remedy for the white fly.

Mr. Waite.—After the white fly has been in a grove a few years, this fungi seems to be a natural parasite following it, and will unaided, in time clean up the trees so they will produce one fine crop in three years, and a medium one year, and comparatively nothing the next, but by assisting the fungi to spread more rapidly we may get fewer off years.

Mr. Bell.—Do I understand that when the white fly gets into a grove that it will bear probably once in three years?

Mr. Waite.—Yes sir, but it is my opinion that if we assist the fungi and snail to spread more rapidly, we will soon lose all fear of the white fly.

Mr. Bell.—Is the damage done by white fly as much as one hundred dollars per acre?

Mr. Waite.—I should say that was a small estimate but if the fungi and snail have your assistance they will keep out the fly, if you will take the pains, and use the time you would consume in spraying, distributing fungi and snails, it would not lessen the value of your grove one dollar. As I have stated the fruit shipped from the grove mentioned was as fine as any I ever saw, while that adjoining this grove was not near as fine flavored, it was covered with sooty mold, which excluded the air and sunlight, necessary to make a fine quality of fruit. The trees stocked with the snail were quite clean by the last of Sept., so they had plenty of sunlight (and fully a month before gathering the fruit,) therefore I think the snail the best friend we have with which to fight the white fly.

Mr. McClung.—Is this mould responsible for the damage that is attributed to the white fly?

Mr. Waite.—Yes sir.

Mr. Bell.—How many oranges did you wash and what was the expense of washing them?

Mr. Waite.—We have cleaned as many as fifty boxes in fifteen minutes, with three men at $1.25 per day. We washed our entire crop of grape fruit and oranges not cleaned by the snail.

Mr. Longley.—I would like to ask about the scale and white fly: Is the white fly more destructive to one kind of fruit than to another?

Mr. Waite.—It is more destructive to oranges than grapefruit, but is worse on tangerine, mandarin and lemon, than any of the others.

Mr. Gist.—I would like to ask what steps I should take if the white fly should appear on my grove. Should I spray or use fungi and snail?

Mr. Waite.—I would advise spraying the first trees showing any sign of the fly, in this way you may be able to hold it in check for several years, but it would pay to introduce the fungi and snail as soon as you see that you have the fly well started in your grove, but not before, for foilage partially covered with the fungi may contain plenty of pupa which may mature in a few days and fly to other trees not stocked with the fungi.

Maj. Healey.—I have sought information on the origin of the white fly and am told that it was brought to this country from China. It might be we could gather some information from there that would aid us in its extermination.

Mr. Sampson.—I would ask if the extermination of the white fly is dependent on fungi, snails, or spraying, and if there would be a full crop the third year.

Mr. Hart.—I would like Mr. Waite's opinion as to how the spraying can be done on bearing trees, and whether or not it would give us a good full crop the third year or a normal one each year.

Mr. Waite.—Six years ago I took charge of the Manatee Lemon Co's groves in Manatee county. The young grove of 225 acres joined another grove that was badly infested with white fly. Our trees were very small, from one to two feet high, we sprayed that portion nearest that grove the first winter, and as we noticed specimens of the fly farther out in our grove, from year to year, so we increased the area. For the first four years we kept the fly down to such an extent that our trees were always glossy, and only an occasional tree would be black from the sooty mould. As the trees became larger it was more difficult to wet the entire foilage, and the Fly would become numerous by October, and portions of the fruit would be black, but these winter sprayings seemed to clean the trees enough so that they would bloom and set a very nice crop of fruit. Our success was fully as good with old seedlings. We did not spray during the past winter, wishing to see what results would follow the introduction of the brown and red fungi, these only work during the rainy season or foggy weather during the fall and winter. By spraying we have increased our crop of fruit each year. It requires more intelligent labor than the ordinary "Darkey" to do successful spraying as one leaf missed may have hundreds of eggs.

Mr. Brown.—What are the surrounding dangers of the white fly? Upon what does it feed?

Mr. Waite.—It feeds upon the orange, lemon, grapefruit and lime, I have also seen it in all stages from the egg to the adult fly, on the chinaberry, persimmon, cape jasmine and prickly ash. While I have never found the larva or pupa on the palmetto and gall berry, I have seen the adult flies quite abundant. The sooty mold attacks the honey dew, following the attacks of many kind of wax scale and mealy bug. Many have sent me specimens of plants or shrubbery covered with this deposit of sooty mold, and asked if it was not white fly. On examination I found only the wax scale, or mealy bug.

Mr. Taber.—I would like to hear from Prof. Rolfs on this question.

Prof Rolfs.—I was getting more information out of this than I could possibly give, but some people are never satisfied until they get things stirred up.

The damage done by the white fly, and the smut which follows it, does considerable damage to the grove that is ordinarily not taken into consideration. The honey dew, which is excreted by the white fly, falls upon the fruit and the upper side of the leaves, this makes a medium in which the smut or sooty mold grows luxuriantly. By its extensive growth it forms a velvety covering over the leaves and fruit and on account of its black color it keeps the sun from penetrating to the leaves and fruit or in a large measure obstructs it. Sunlight as we all know is absolutely necessary for the welfare of our orchard trees, and is also absolutely necessary for the maturing of the fruit, consequently, when the sunlight is cut off almost completely, as is often the case with this sooty mold covering, the fruits cannot mature properly. This is brought out very strikingly when the fruit is run through a washer. The fruit as it hangs on the tree appears to be perfectly ripe but when it comes out of the washer it is half green, the green area extending as far as the fruit is covered with the sooty mold.

The Manatee snail does not destroy the white fly as a number of people have asserted. No one who has studied the work of this snail with a hand lens, which is the proper way to study it, will contend for a moment that the snail does any harm to the white fly. It merely feeds on the sooty mold cleaning it off completely from the leaves and from the fruit, doing the work much more perfectly than any washer yet invented.

The good work of the Manatee snail in clearing off the sooty mold was strikingly apparent in a number of cases. The trees that had been cleared of the sooty mold a year before produced an abundant bloom and set a heavy crop of fruit, while the adjoining trees bloomed rather sparsely and set, probably, a half crop of fruit. So far as the natural conditions surrounding these trees was concerned they seemed to be alike, there was every reason for believing that the beneficial effect was attributable to the work of the snail.

Maj. Fairbanks.—I would like to know about the white fly on younger growth, as it did not seem to be on the older growth.

Professor Rolfs.—The females deposit their eggs on the younger foliage, as young trees are usually making a vigorous growth, these are apt to have more eggs deposited upon them proportionally than the large trees. It sometimes happens that a tree will send up a water sprout while the rest of it is practically dormant, if this occurs during the flight of the white fly, the water sprout will be

found to have received myriads of eggs on the lower side of the leaves.

Mr. Henderson.—I want to touch on one point about the white fly. I am not properly in the orange belt, but I have about one hundred trees. In the fall of 1904 the white fly appeared on one tree. I was told if I would cut all the leaves off the one tree I would be free of the white fly, which I did. This is good. I had them only on the one tree.

Prof. Rolfs.—In the matter of keeping the white fly restricted to the area already inhabited. I may cite one instance that occurred among a number, in which we succeeded in eradicating the fly after it had become pretty well established, I am referring to the case that happened at West Palm Beach. A wealthy gentleman who had a fine house at Orlando, decided to build a finer one at West Palm Beach, and after the house was built he carried with him some trees and shrubs. After these had been set out, probably some six months, it was discovered that they were infested with white fly. Permission was obtained to destroy every thing to which the white fly had spread, all the shrubbery, including citrus planted out, were grubbed up and burned, some of the stuff such as the stems of banana plants that would not burn were thrown into the lake.

Later investigations failed to bring to light any white fly, we think therefore, that the pest was stopped and eradicated at the point of infection. If the infection is checked before migration of the white fly takes place, I think it entirely possible to eradicate it.

Mr. Cook.—How did you destroy the white fly? If he is in the air, is he killed, or will he propagate a second year?

Prof. Rolfs.—The white fly in its complete development goes through the egg stage; the larval stage, during the first part of which it crawls about and during the latter part it remains stationary; the pupa stage which to the unaided eye is not very different from the larval stage, but can be distinguished from it by the use of a hand lens; and the last stage or adult state. During the last stage is the insect able to fly and only during this stage does it reproduce itself.

During the summer season the eggs hatch in about three days. The larval stage lasts for about twenty five days, the third stage or pupa stage lasts for about ten days. The adult insect lives only a very short time, the females lay about all of their eggs during the first twenty four hours, the adult flies live only about three or four days. The time required for an entire generation during the summer time, according to Professor Gossard, is about forty or fifty days, while during the winter portion of the year it may be nearly six months.

Mr. Cook.—Does the white fly only live long enough to propagate the first time? Does it lay more than one crop of eggs?

Prof. Rolfs.—The white fly appears to lay only about twenty five eggs and when this hatch is laid off she does not appear to lay a second batch.

Mr. Cook.—I can spray my trees, but the white fly commences laying her eggs the next night. I have not been able to destroy the eggs.

Prof. Rolfs.—During the summertime there is almost a continuous appearance of adult flies, there are, however, periods during which only few are on the wing, at such a time the work of combatting this pest can be carried on to best advantage.

Mr. Cook.—Do I understand that they disappear after laying?

Prof. Rolfs.—There are three or four periods during which the adults appear in countless numbers. During this time it is probably not best, to spray, excepting where it is done for special purposes, spraying can be done most effectively between the broods.

Mr. Griffing.—Prof. Rolfs mentions that a large portion of the State is now free from the white fly. While this discussion has been confined to Manatee, I would ask if it can be determined just where the territories are that are now affected.

Prof. Rolfs.—We can not give you the definite data as to what portions of the State are infested with white fly and what portions are not. Prof. Gossard had this pretty thoroughly worked out, but we know that every year the insect is spreading to new districts and we know how reluctant people are especially if he happens to be a Nurseryman to admit that white fly is present on his premises. A man might not hesitate to state the fact privately but he would not like to have it advertised.

Mr. ——.—I have specimens of fungus which I presume the citrus growers are familiar with. Last year the State was full of this particular fungus. The damage is not known as yet, but we hope to know about it soon. Last year we had scarcely any scab at all, but this year we have an abundance of it. Some one found that by spraying the scab with Bordeaux mixture that it could be controlled. This scab will develop on the sweet trees also. Also on grape fruit it is very severe. [The fungus referred to is the sour orange scab. Cladosporium eleganus. Sec.]

Mr. Longley.—Is it more prevalent on grapefruit or oranges?

Mr.——.—On lemon it is more severe than on any citrus stock.

Mr. Longley.—Is the fungus shown on vigorous growing trees?

Mr.——.—The fungus attacks trees when they are very small, and it seems to make very little difference whether the tree is growing thriftily or not. I believe, however, we see it more frequently on thrifty trees.

Mr. Longley.—Will the fungus spread during the summer?

Mr. ——.—Very little growth appears during that time, but if we have a dry season we are not apt to get much of it. It requires a rainy season for this to grow.

Mr. Longley.—Did that same fungus attack lemon trees prior to the freeze.

Mr. ——.—Yes.

Mr. Beers.—Will inoculation of bluestone be beneficial?

Mr. ——.—I should say, no. This would have no preventative effect.

Mr. Taber.—To what extent have you found this scab affecting trees?

Mr. ——.—Some sweet oranges are sometimes affected slightly; the satsuma, very badly. Ordinary oranges we have no trouble with at all after the buds begin to grow. The scab I referred to was that on tall bearing trees, and so differs in that respect.

Mr. Waite.—Referring to the sour scab on the grapefruit, I will say that in the last few days I have received a letter from a gentleman who says his trees are all more or less effected with fungi, with the exception of about two acres where the trees are located on a shell mound, there they seem to be free from it, is it lime the trees require?

Dr. Rolfs.—I cannot answer as to this question as we have made no experiment

on this line. It may be due to location, soil, or the shell.

Mr. Fairbanks.—Is there any way of producing and developing non-resisting trees?

Mr. Brown.—It may be possible that there are some varieties of grapefruit that are more resistent than others.

President McCarty.—This is a matter worthy of study. I hope something may be attempted along this line. I think it probable that something can be done, but I cannot tell how long it will take.

Mr. Brown.—There is one other disease, that is withertip: I do not know how many here are familiar with it. If there are those here who know anything about the withertip, I will beg to hear from them.

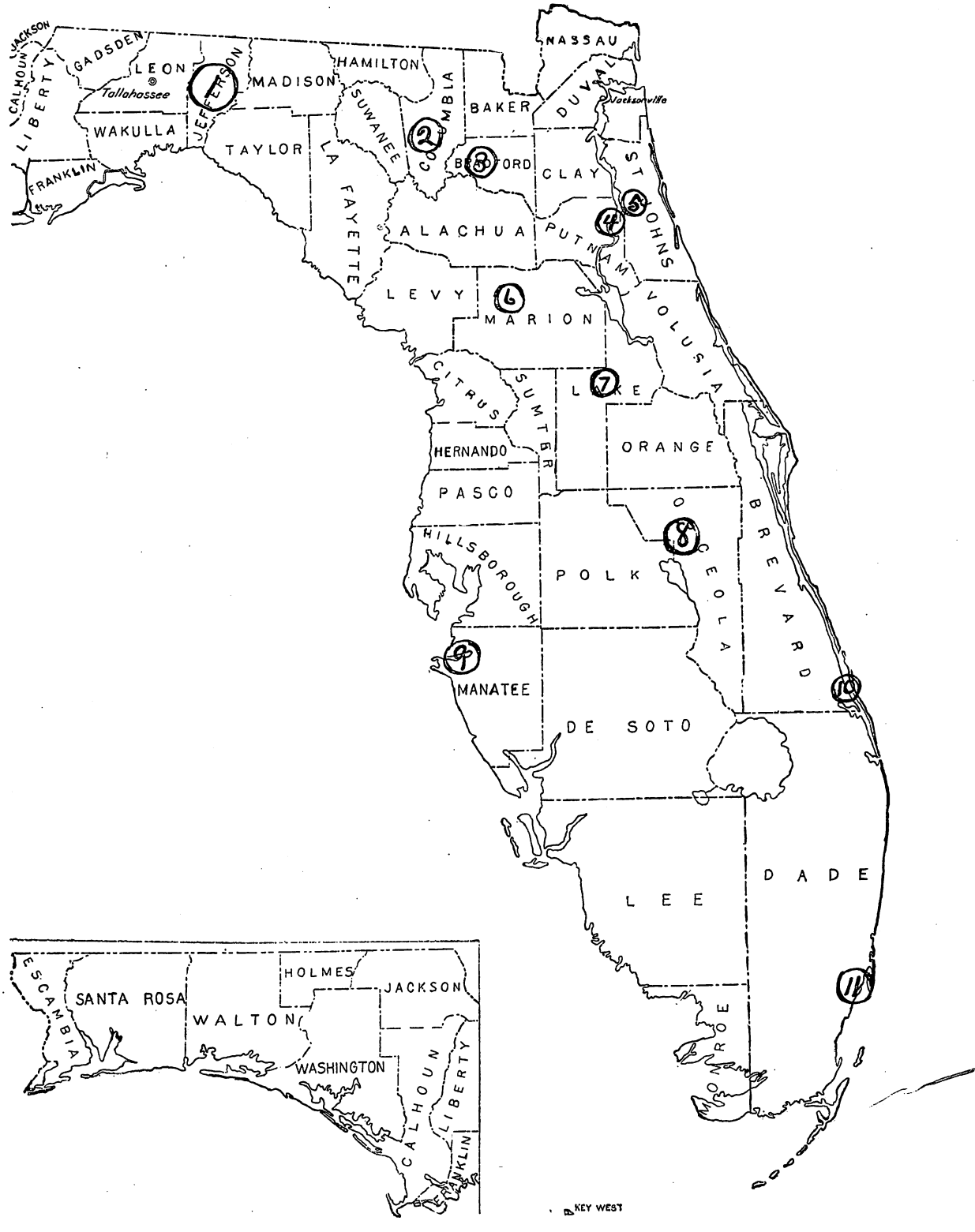
Prof. Rolfs.—I have been studying the disease (withertip) for the last four years, and have also treated groves varying in size from a few trees up to over twenty acres in extent. The methods of procedure are pretty thoroughly worked out. A bulletin on this subject was published from the Department of Agriculture, Wasington, D. C., and a revised edition of this bulletin is now being prepared.

In addition to my own experience in treating this disease, I have given advice to many grove owners and have watched the application of this advice. Where the work is done thoroughly and followed up conscientiously the results have always been satisfactory. A number of groves that were treated according to advice, and were very badly infected with the disease, are now practically free. As there are a number of men present who have had practical experience in combating with this disease, I should like to hear from them.

Mr. Phelps.—I have several groves that have been badly effected by this withertip; my fruit dropped badly and I wrote to Professor Rolfs but did not hear from him promptly, so I wrote to a sprayer and asked about inoculating with bluestone. I asked him if it would not have the same effect as spraying. I urged inoculating, mixing equal parts of blue stone and air slacked lime. I have been doing this and find that after it has been in about ten days or two weeks there is a great deal of gum coming out. That is as far as I have gotten and I do not know what the effects will be.

Mr. Hart.—Before we leave the matter of diseases and insects there is a very important matter. I am losing trees briefly. A year ago I introduced a resolution asking that we get more assistance from the Agricultural Department in the study of blight. I took it up with Mr. Wilson who promised to help us if we could get in shape to receive it. I want to put in the same resolution. This is an important matter. I am losing trees now that would bear ten or twelve boxes each year, and I am putting in new trees in each place and have a tree growing wherever there is a place for it, but my grove is uneven. I am not alone in this experience; this disease is all over the State but we do not know much about it yet and it is something we should look after.

Mr. Painter.—Your Secretary presented the resolution to Secretary Wilson in person, Mr. Wilson said he would be glad to do more than they were doing if he could but that all of their appropriation for this class of work had been used up. I am confident the only way we can get an appropriation for this work is to take it up with our Senators and Representatives and get them to ask for an appropriation.



MAP SHOWING LOCATION OF CO-OPERATIVE EXPERIMENTS.